SMITH (J. LAW.)

DU PONT'S ARTESIAN WELL,

LOUISVILLE, KENTUCKY.

REPORT, ANALYSIS,

AND

MEDICAL PROPERTIES OF ITS WATER.

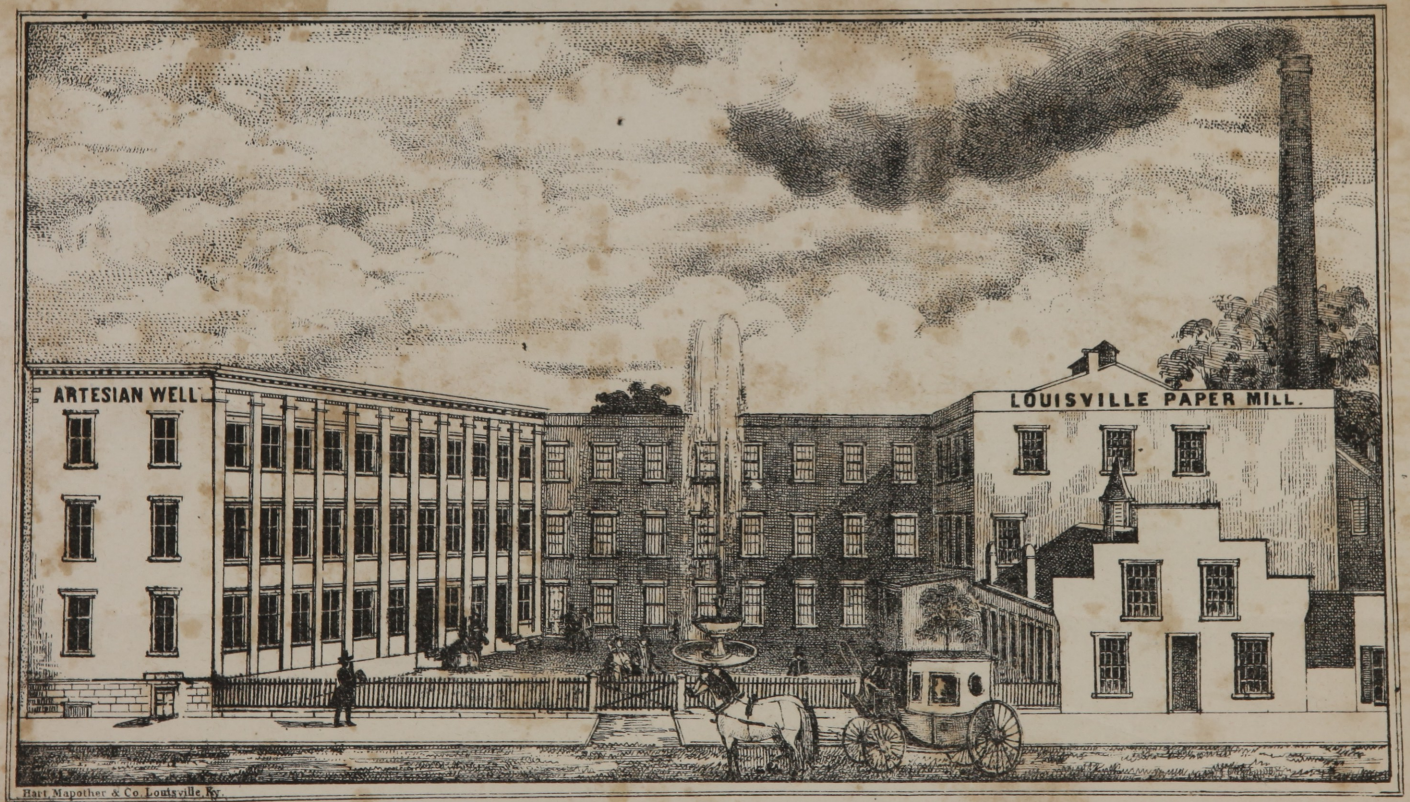
WITH REMARKS UPON THE

NATURE OF ARTESIAN WELLS.

By Prof. J. LAWRENCE SMITH,

OF THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF LOUISVILLE.

ARTESIAN WELL,
AT LOUISVILLE PAPER MILL,
ON TENTH STREET, NEAR MAIN,
1859.



NORTH VIEW OF DUPONT'S ARTESIAN WELL, LOUISVILLE, KY.

DU PONT'S ARTESIAN WELL,

LOUISVILLE, KENTUCKY.

REPORT, ANALYSIS,

AND

MEDICAL PROPERTIES OF ITS WATER.

WITH REMARKS UPON THE

NATURE OF ARTESIAN WELLS.

By Prof. J. LAWRENCE SMITH,

OF THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF LOUISVILLE.

ARTESIAN WELL,
AT LOUISVILLE PAPER MILL,
ON TENTH STREET, NEAR MAIN.
1859.

DU PONT'S ARTESIAN WELL,

LOUISVILLE, KY.

Report, Analysis & Medical Properties of its Water,

BY PROF. J. LAWRENCE SMITH, M.D.

OF THE MED. DEP. UNIVERSITY OF LOUISVILLE.

Commencement of the enterprise.

The Artesian Well, forming the subject of this report, is one of the most interesting objects of the kind to be found in any part of the world. It was undertaken by Messrs. C. I. & A. V. Du Pont, of Louisville, prosecuted with great energy and large expenditure, and accomplished in a much shorter time than any similar undertaking of the same magnitude. The practical skill of Mr. Blake directed the construction of the efficient machinery employed, and so successful was he in the superintendence of the operations, that not a single detention was experienced from the commencement to the termination of his labors.

The citizens of Louisville were not aware of what was going on in their midst, until some time in the month of August, 1858, the public prints announced, that at the paper mill a jet of mineral water was pouring forth in vast volumes from a boring two thousand and eighty-six feet in depth.

In giving an account of Du Pont's Artesian Well, it will, no doubt, interest many to learn something as regards the nature and history of Artesian Wells. The principal difference between the ordinary and Artesian Well, is, that the latter is very much smaller in diameter than the former, and penetrates the earth to a much greater extent.

In digging the ordinary well the instruments employed

Nature of Artesian Wells, and manner of boring them.

are the spade and pick, or blasting with gunpowder when rock is penetrated. To form an Artesian Well, very different instruments are employed, some are not unlike an auger, but the more usual ones are in the form of chisels. It is proper to commence by erecting a tall shed over the spot where the boring is to take place, some thirty or forty feet in height and eight or ten feet square at the base, gradually diminishing in size upwards. This is done for the convenience of elevating and storing away the long rods used in making these wells. Long rods of hickory, or other strong fibrous wood, are procured; they are from one and a half to two inches in diameter, about thirty feet in length, and so arranged at their extremities by iron casings as to be easily and securely fastened to each other, while they admit of being equally readily detached. It is to the extremity of the rod that the chisels and other excavating tools are attached, as also the long, narrow bucket for taking up the loose materials detached by the excavating tools. Mechanical arrangements are next made for hand, horse, or steam power, to give an up and down motion to the rod, of fifteen to twenty inches, while a slow, circular motion is given to it by some one standing over the boring.

Thus furnished, it is best, when the nature of the ground admits of it, and it is expected to go to a considerable depth, to commence by sinking an ordinary well four or five feet in diameter, and ten to fifteen feet deep, provided it can be done without interruption by water; next, attach one of the tools to the end of the rod, and pierce the ground with a hole, varying from two to nine inches in diameter. Most commonly, if the well is expected to be of great depth, it is commenced with a calibre of from five to nine inches, and afterwards diminished to three or four inches, or even less.

If the boring passes through sand, or loose material, it becomes necessary to place in the well strong tubes to

sustain the sides, as otherwise, the loose material becoming detached, may at any time fill up the boring; in this way the well at Charleston, South Carolina, was, on one occasion, filled up one hundred and forty feet in a single night. When the boring is through rock, tubing is not usually required.

How Artesian wells are supplied.

The supply of water to Artesian Wells follows the same law as other wells and springs, viz: The water rises in them to no greater height than that of the source. In this city the water rises in the ordinary wells to within forty feet of the surface, for the simple reason that the level of the basin of water in the gravel under the city is that depth beneath the surface. In Artesian Wells, that are considered successful, the boring is carried to such depth that some vein of water is encountered, having its connection with a source much higher than the surface of the Artesian Well, thus insuring a flow of water above the surface of the ground. It does not, however, always happen that the water in Artesian Wells rises to the surface. Many of the salt wells in Virginia, and elsewhere, are of this character, and the water has to be pumped to the surface. There is a well of this last description, at Brighton, England, from which seven hundred gallons are pumped every minute.

Antiquity of Artesian wells.

This method of forming wells is of very ancient date. The Chinese employed it one or two thousand years ago, but the introduction of it into one of the provinces of France (the ancient Artesium) during the reign of Louis XIV, is what has given the generally received name to this class of wells.

In what formations most successful.

The more recent geological formations, as the tertiary and upper secondary, can be bored with better hopes of success than the older formations, but when the older strata furnish supplies of water, they are generally very abundant, for in the old secondary rocks are found those great chasms and caverns so celebrated in various parts of the world, for the rivers that flow through them, and

are lost in them; as the cavern of Guacharo, in South America, which Humboldt traced for two thousand four hundred feet, finding all along its extent a river thirty feet wide, rolling along the floor of this magnificent cavern. In the cavern of Adelsburg, in Carniola, the river Pœck engulfs itself; it appears and disappears many times, and has been traced under ground, through an extent of six miles, as far as a large lake. The fountain of Vaucluse also issues from subterraneous rocks, and pours forth a volume of thirteen thousand cubic feet per minute, even under ordinary circumstances, and this is sometimes increased to forty thousand cubic feet. But to us there is no more interesting cavern containing abundant streams than the far-famed Mammoth Cave.

Penetrating various seams of water.

In passing through the various strata, with the boring apparatus, it commonly happens that distinct sheets of water are penetrated, having no connection with each other; as for example, in the works which have been undertaken for the search of coal at St. Nicholas Aliermonte, near Dieppe, in France, seven great sheets of water were passed through at the respective depths 76, 307, 537, 645, 768, 850, and 1,030 feet. In coming upon the seams of water in Artesian Wells, it may be that they merely percolate porous sand rock, or they are regular caverns in the rock, varying in depth from a few inches to twenty or more feet.

Made in level as well as in broken countries.

The surface of the country in which these wells may be made successfully, furnish no indications. In the province of France from which the name of these wells is derived, the water comes up in immense plains where no hill is seen even in the distance. Of course, the water comes from some point higher than the plain; it may be fifty miles distant, it may be one hundred miles or more, and where the geological formation of the country is the same we could hardly set a limit to the distance from which the water might come. In fact they are now boring successfully for water in the African deserts.

Considerable interest connected with these wells is the indications they furnish of the gradually increasing temperature as we descend into the earth; at different places there is a slight difference in the ratio at which the temperature increases. In descending from the surface of the earth by excavation we come to a depth at which the thermometer will stand at the same point all the year. At Paris, France, this depth is ninety feet, and the temperature 53° Fahr.; in passing below this point the temperature gradually increases in a uniform ratio of 1° for every additional sixty-one feet, so that the deepest excavation at that place, being one thousand eight hundred and six feet, has at the bottom a constant temperature of 81°. The ratio in Scotland is 1° for forty-eight feet of descent; the mean of seventeen wells in other places in Europe gives 1° for every fifty-three feet. The experiments made on the well at this place, taking the constant temperature at ninety feet to be 53°, show an increase of 1° of heat for every sixty-seven feet of depth. It is not the object of this report to enter upon speculation as regards the causes of the gradual increase of temperature. Temperature of Artesian Wells.

The uses of Artesian Wells are various, as will be seen by reading the following extract from Tomlinson's Encyclopedia: "Artesian Wells have not only been employed for providing houses with water, but their waters have also been used as a moving power. In the village of Gonehem, near Bethume, there are four borings to the depth of one hundred and twenty feet; the waters are conveyed into the water course of a flour mill, and are also made to subserve agricultural purposes. The little town of Roubaix, near Arras, was in danger of losing its principal means of support, by its silk spinning and dye works, from want of water. Artesian Wells were sunk, one of which yields two hundred and eighty-three cubic yards of water per day, or double the power of a steam engine of twenty horse Use of Artesian Wells.

power. At Tours an Artesian Well pours two hundred and thirty-seven gallons of water per minute into the trough of a water-wheel twenty-one feet in diameter, which is the moving power of a large silk factory. In another place at Fontes, near Aire, the united waters of ten wells are made to turn the mill-stones of a large mill, to blow the bellows and to beat the hammers of a nail manufactory.

"The constant high temperature of these waters renders them especially valuable during winter, either as a moving power or as a means of thawing and washing away the ice which impedes the motion of water-wheels in time of frost. In Wurtemburg the water of several Artesian Wells is transmitted through metal pipes, arranged in large manufactories, and thus a constant temperature of 47° is maintained at a season when the external temperature is at zero. Green-houses have been heated in the same way, and Artesian waters have been applied at Grenelle as a source of warmth to hospitals and other public buildings. By introducing the water of Artesian Wells into fish ponds the extreme variations have been prevented. Artificial cress plots have also been formed and supplied by means of those wells with pure water of a steady temperature. The artificial cress plots of Erfurt produce a large annual revenue. Paper mills have also been supplied with the pure water of these wells at periods when the heavy rains have made the river water muddy. In the Department du Nord the fine linen used in the manufacture of cambric, lawn, lace, etc., is prepared from flax rotted in pools, which are supplied by Artesian waters; by their purity and invariable temperature, the soluble portions of the flax are more quickly removed, and the valuable qualities of the filaments retained in higher perfection. Such are a few of the advantages and practical applications of Artesian wells."

It is doubtless a point of interest to enumerate some

of the more remarkable Artesian Wells, to contrast them with the one now under report. At the head stands the

GRENELLE WELL AT PARIS.

It was commenced in 1834 and completed in 1841, at which time the rod suddenly descended several yards, and shortly after, the water rose to the surface in vast quantities. For the first fifty feet the boring was twelve inches in diameter, which was reduced to nine inches, and thus carried to a depth of one thousand one hundred feet; a farther reduction was made to seven and a half inches until the depth of one thousand three hundred feet was reached; and a final diminution to six inches to the termination of the well at one thousand eight hundred and six feet. From the completion of the well to the present time there has been a steady flow of over half a million of gallons in twenty-four hours, of a temperature of 81°. Grenelle.

KISSINGEN WELL IN BAVARIA.

This is even deeper than the Grenelle well, being one thousand eight hundred and seventy-eight feet; the last hundred and thirty-eight and a half feet passes through rock salt. From this well one hundred cubic feet of water gushes forth every minute. The water contains three and a quarter per cent. of salt. Kissingen.

AIRE IN ARTOIS,

In the monastery of St. Andre. This well was bored more than a century ago and has flowed steadily ever since. The water rises eleven feet above the ground, and supplies nearly two hundred and fifty gallons per minute. Aire in Artois.

CHARLESTON WELL, IN CHARLESTON, S. C.

This well has been sunk to the depth of one thousand two hundred and fifty feet, and yields thirty thousand gallons in twenty-four hours, flowing ten feet Charleston.

above the surface. Another is now being bored at the same place, twelve inches in diameter, and it has already reached the depth of one thousand feet.

BELCHER'S WELL IN ST. LOUIS.

St. Louis.

This well was commenced in 1849, and completed in 1854. The water does not answer the purpose for which it was undertaken. The amount of water flowing from it is one hundred and eight thousand gallons in twenty-four hours. Its depth is two thousand one hundred and ninety-nine feet.

LAFAYETTE WELL.

Lafayette.

An Artesian Well has lately been made in Lafayette City, Indiana, of a depth of two hundred and thirty feet. The water rises a few feet above the surface, with the flow of four gallons per minute. This is a mineral water, containing about four hundred grains of solid matter to the gallon. Dr. Charles M. Wetherill has lately made an interesting report upon it.

DU PONT'S ARTESIAN WELL.

Depth 2,086 *feet—Flow of Water* 330,000 *gallons in* 24 *Hours—Elevation of Water above the Surface,* 170 *feet.*

This work was commenced in April, 1857, from the bottom of one of the wells of the factory, that has a depth of twenty feet; the boring tools employed made a hole five inches in diameter to the depth of seventy-six feet from the surface; the boring was now reduced to three inches, and thus continued to the bottom of the well, a depth of two thousand and eighty-six feet. The flow of water is three hundred and thirty thousand gallons in twenty-four hours, and the elevation above the surface one hundred and seventy feet.

The rock penetrated

The rock struck, which geologically belongs to the "Devonian series," is for thirty-eight feet shell limestone, then for forty feet coraline limestone; at which depth the upper silurian is reached. Without being able

to make out, with any degree of certainty, the amount of upper silurian passed through, we suppose it to be over one thousand two hundred feet. At the depth of one thousand six hundred feet a sand rock was reached, doubtless of the lower silurian, and ninety-seven feet deeper was encountered the first stream of water which reached the surface. This flowed out abundantly and with much force. The quantity not being sufficient, the boring was continued. After this, it was unnecessary to use the bucket to take out the material detached by the borer, the force of the water bringing up the fragments very readily. The water increased in quantity in going deeper, the increase being more marked at one thousand eight hundred and seventy-nine feet, and still more at one thousand nine hundred feet, when pieces of rock weighing an ounce or two came up with the water. The water increased every ten or twenty feet to the depth of two thousand and thirty-six feet; here a very hard magnesian limestone was encountered six feet in thickness. After which the sand rock reappeared, and for the next fifty feet there was no increase of water.

The following table exhibits the appearance of the rock as far as it is possible to make it out by the fine fragments taken out at different depths:

For seventy-six feet, sand and gravel.
Next one hundred feet, tolerably pure limestone, with fragments of fossils.
Next twelve feet, soft limestone mixed with clay.
Next fifty-two feet, tolerably pure limestone mixed with fossils.
Next five feet, limestone with ferruginous clay.
Next eighty-one feet, gray limestone.
Next one hundred and ten feet, limestone mixed with clay.
Next one hundred and forty-nine feet, tolerably pure limestone with many portions quite white.
Next thirteen feet, clay shale with little calcareous matter.

Next two hundred and seven feet, limestone with a little blue clay shale.

Next thirty-three feet, same, a little darker and more shale.

Next ninety-four feet, pure, very white limestone with fossils, alternating with very dark limestone (color likely from organic matter) with some dark shale.

Next twenty-six feet, shaly limestone.

Next forty feet, very light and hard pure limestone.

Next one foot, white clay.

Next five hundred and forty-six feet, gray limestone, alternating hard and soft.

Next forty-one feet, sand rock, white.

Next four feet, same, very fine and hard, with little limestone.

Next sixty feet, same, with more limestone.

Next seventy-two feet, same, with less limestone.

Next three hundred and eight feet, same sand rock, with but little limestone.

Next six feet, magnesia limestone, very hard.

Next fifty feet, sand rock again.

At the urgent request of many citizens of Louisville, the boring was now stopped to give a fair test of the medical virtues of the water that was pouring forth at the rate of two hundred and thirty gallons per minute, or about three hundred and thirty thousand gallons in twenty-four hours. The water by its own pressure rises in pipes one hundred and seventy feet above the surface. The boring was accomplished in sixteen months, and the depth reached is two thousand and eighty-six feet, which depth we can better conceive of by referring to corresponding hights, as represented by spires in our city; imagine seven such spires as that of the Catholic Cathedral piled on each other. In order to conduct the water to the surface and prevent its passing off into the gravel beds below, a tube five inches in diameter leads from the surface to the rock, a depth of seventy-six feet, into which it is driven with a collar of vulcanized gum elastic around it. No tubing is found necessary for any other part of the boring.

Quantity and elevation of water.

Entire depth of the Well.

When the size of the bore (three inches in diameter),

and its depth are considered, the flow of water from the well is unequalled by any other Artesian Well yet constructed that flows above the surface, for although the Grenelle well at Paris delivers six hundred thousand gallons in twenty-four hours, it has at the bottom an area six times as great as the Dupont well, and a few hundred feet up seven times as great. A corresponding diameter to Dupont's well, would, according to just and reasonable calculations, furnish about two millions gallons in twenty-four hours; also, the elevation of the water above the surface is greater than that of any other Artesian Well, and only exceeded in depth by the Saint Louis well, and that to an extent of but one hundred and thirteen feet. Striking features of the Well.

The water comes out with considerable force from the five-inch opening, and a heavy body thrown into the mouth of the well is ejected almost as readily as a piece of pine wood. By an approximate calculation, its mechanical forceis equal to that of a steam engine with a cylinder of ten by eighteen inches, under fifty pounds pressure, with a speed of fifty-five revolutions per minute, a force rated at about ten horse power. The top of the well is now closed, and the water conducted about twenty feet to a basin with a large *jet d'eau* in the center, from which there is a central jet of water forty feet in hight, with a large water pipe, from which the water passes in the form of a sheaf. When the whole force of water is allowed to expend itself on the central jet, it is projected to the hight of from ninety to one hundred feet, settling down to a steady flow of a stream sixty feet high. Hight of jet.

Temperature of the Water.

The water, as it flows from the top of the well, has a constant temperature of 76½° Fahr., and is not affected either by the heat of summer or the cold of winter. The temperature at the bottom of the well is seven de-

grees higher than this, as ascertained by sinking a Walferdin's registering thermometer to the bottom, which indicated 82½° Fahr. Taking as correct data, that the point of constant temperature below the surface of Louisville is the same as at Paris, viz: 53° Fahr., at ninety feet below the surface, we have an increase of 1° of temperature for every sixty-seven feet below that point. The increase in Paris is 1° for every sixty-one and two-tenths feet. The temperature of the water is sufficient for comfortable bathing during most of the year, a circumstance that will be of considerable importance, if it ever be turned to the use of baths. The reason of the difference of 6° between the water at the bottom of the well and at the top is, that the iron pipe leading from the surface to the rock passes through a stratum of water sixty feet thick, having a temperature of 57°.

Temperature at the bottom of the Well.

The Source of the Water.

Source of the water.

The question naturally arises, if the vein of water supplying this well has a connection with some distant source higher than the surface of Louisville, where is that source? From all that we have been able to learn of the geology of this country, taking Louisville as a center, the first rocks encountered corresponding to the sand rock (in which the water of the Artesian Well was struck) are in Mercer, Jessamine and Garrard counties, near Dix creek, to the east of Harrodsburg. The rocks there are said to be cavernous and water bearing. The elevation is about five hundred feet greater than Louisville, and about seventy-five miles in a straight line from the city. This being the most probable source of the water, from whence comes its mineral constituents? These are obtained from the rocks through which it percolates in its way from its source to the point below Louisville where it has been tapped, and where it will doubtless flow in undiminished quantity for centuries

to come, as wells having such deep sources as this are usually inexhaustible.

Nature of the Water.

Analysis.

The water is perfectly limpid, with a temperature, as already stated, of 76½°, which will be invariable all the year round. Its specific gravity is 1.0113. The solid contents left on evaporating one wine gallon to dryness, are 915½ grains, furnishing on analysis:

Chloride sodium,	621.5204
" calcium,	65.7287
" magnesium,	14.7757
" potassium,	4.2216
" aluminum,	1.2119
" lithium,*	0.1012
Sulphate soda,	72.2957
" lime,	29.4342
" magnesia,	77.3382
" alumina,	1.8012
" potash,	3.2248
Bicarbonate soda,	2.7264
" lime,	5.9915
" magnesia,	2.7558
" iron,	0.3518
Phosphate soda,	1,5415
Iodide magnesium,	0.3547
Bromide magnesium,	0.4659
Silica,	0.8857
Organic matter,	0.7082
Loss in analysis,	8.1231
	915,5582

GASES IN ONE GALLON.

Sulphuretted hydrogen,	2.0050
Carbonic acid,	6.1720
Nitrogen,	1.3580

Comparison of the Water.

Comparison with other waters.

This water is very analogous in composition to the far-famed Kissingen water of Bavaria, and of Blue Lick

* After the first analysis was made, I was induced to seek for the presence of this substance, more as a matter of chemical curiosity, and operated on fifteen gallons of water; the result is as stated in the table. J. L. S.

in Kentucky. The following tabular statement will afford a comparison of these three waters by the number of grains of solid matter in one gallon:

	Du Pont's Well. SMITH.	*Kissingen.* KASTNER.	*Blue Lick.* PETER.
Chloride sodium,.....	622	517	533
" calcium,.....	66	...	...
" magnesium,...	15	58	83
" potassium,.....	4	7	2
" aluminum,.....	1	2	...
" lithium,.....	1–10	trace	...
Sulphate soda,.....	72	16	...
" lime,.....	29	21	33
" magnesia,.....	77	...	...
" alumina,.....	2	4	...
" potash,.....	3	...	9
Bicarbonate soda,.....	3	7	...
" lime,.....	6	29	23
" magnesia,..	3	21	1
" iron,.....	½	6	...
" strontia,...	...	trace	...
Phosphate soda.....	2	2	...
Iodide magnesium,.....	⅓	trace	...
Bromide magnesium,...	½	5	⅓
Silica,.....	1	16	1

In the analysis of the Blue Lick water, Professor Peter estimates the alumina, phosphoric acid, and iron compounds under one head. We have, therefore, not been able to carry them out separately. In the analysis of the Kissingen water, by Kastner, the alumina is estimated separately, and, in his combining the acids and bases, formed by analysis, he has thought proper not to combine any of the chlorine with the calcium, nor any of the sulphuric acid with potash. Had this been done, the similarity of these waters would have been even more striking.

It is well to remark, for the benefit of the general reader, that the chemist in analysing mineral water, discovers by direct process, the amount of acids and bases, and by subsequent calculation determines how they are combined so as to form the various salts, as

for instance: by one process, the amount of sulphuric acid is determined; by three others, the soda, lime, and potash. As to what portion of the last three are combined with the sulphuric acid, this he does not arrive at by analysis, but by calculation; and as there is no one data for making these calculations, different chemists may differ in the way they state the salts, although they may agree exactly in regard to the quantity of acids and bases in these salts. Were the analysis of these mineral waters all calculated on the same basis, their similarity would have been better contrasted, but I preferred giving the analysis of each one as it appeared before the public, made by able and well known chemists. As regards the gaseous contents, the Kissingen does not contain any sulphuretted hydrogen gas. The Du Pont and Blue Lick contain within a small fraction of the same amount.

Saratoga Water.

As it has been often asked, what is the difference between this water and that of the Congress Springs at Saratoga? I would state that the last contains three hundred and eighty-five grains of common salt to the gallon, and differs from that of Du Pont's Well in the large amount of carbonic acid, and the larger proportion of carbonate of lime and carbonate of magnesia, and in the absence of the sulphates; the proportion of solid constituents is also less in Saratoga water.

The Blue Lick Spring, situated in Nicholas county, Kentucky, is so well known in this country that it is unnecessary to make any statements concerning it. The Kissingen Spring not being so well known, a few remarks concerning it would be in place. These springs are situated in the Northern part of Bavaria; and it is in this neighborhood that one of the Artesian Wells, mentioned in this report, has been bored, but it has no relation with the springs that have rendered this place so celebrated for a number of years. Since 1821 these springs have attracted special notice, and there have

been no less than ten or twelve lengthy reports made upon them since that time, by the best chemists and physicians of Germany. Of the several springs in Kissingen, the most famous is the Rakoczy, and every year there are upwards of five hundred thousand bottles of water sent from it to all parts of the world. It is to the water of this spring that chemical analysis shows the water of the Du Pont well to be closely allied.

Medical Properties of Du Pont's Artesian Water.

Medical Properties.

Before making the medical report on this water, I would state that mineral waters are, like other medicinal agents, only to be used under the judicious advice of intelligent physicians. Mineral waters, in the treatment of disease, take a place between medical and dietetic treatment, and become eminently useful in a variety of diseases that require, for the cure or alleviation, the continued use of some mild and gentle remedy, that may be taken in connection with the ordinary drink and food.

Perhaps there is nothing which puzzles the physician more than the peculiar virtues of many mineral waters. After the chemist has analyzed them, they are found to contain many well known constituents, some in very small quantities; and it seems impossible with our present knowledge, to reason fully as to what the medical nature of a mineral water will be from its chemical composition. The great value of the chemical analysis is to compare the composition of one water with another whose medical virtues are well established. It is upon this basis that the following general remarks are made, as to what we may expect from the Du Pont Artesian Well water.

Taken Internally.

Internal use.

The peculiar benefit arising from the use of saline waters to the mucous membrane of the stomach and

digestive canal, is sufficiently well established by the daily use which both man and animal make of saline substances. If taken moderately they excite the appetite, and are looked upon as a mild and efficacious aid to digestion; in still larger doses they excite in a more marked manner the entire mucous lining of the intestinal canal, extending to the liver; and, taken into the circulation, their effects are felt in all secretive and excretive organs, as the kidneys, etc. From what we can arrive at by the composition of this water, in connection with the known virtues of similar mineral waters, this water is certainly calculated to meet as large a variety of those diseased, who resort to mineral waters for relief, as any other known spring; for the great portion of invalids using mineral waters, suffer from some derangement of the mucous membrane of the intestinal canal, or of the serous surface of the joints, embracing the various forms of dyspepsia and rheumatism. But we will proceed to specify the applicability of this water.

Dyspepsia.

Dyspepsia.

This single term implies a variety of diseases by which the digestive organs are impaired, and, although no one treatment can apply to them all, this mineral water will meet as large a variety of them as any other. In cases of dyspepsia, whether caused by irritation or weakness, the continued and judicious use of sulphur saline water frequently effects a cure, as in that relaxed condition of the mucous membrane in the stomach and intestinal canal of elderly persons, where a very large amount of mucous is secreted without a proper portion of the other healthy secretions; also, where the stomach has been deranged by excess of either eating or drinking.

Costiveness

Costiveness.

Is a very frequent accompaniment of the above disease, or it may arise from a torpid condition of the in-

testines alone, without any complication with the stomach; in either case good results may be expected from proper use of this water. But we must not be astonished if laxative effects are not produced by the water when the action of the skin is defective. The skin must first be brought into proper action by the bath or other proper medical treatment.

Derangements of the Liver.

Diseases of the Liver.

When these do not arise from organic disease of the liver, but it has become affected sympathetically, or by its connection with the stomach and intestines, this water may be resorted to with good effect. In other diseases in which defective digestion or assimilation seems to be the prime cause, as in gravel, gout, etc., the use of this water may give relief.

Nervous Diseases,

Nervous Diseases.

Arising from derangement in the blood, or from local causes, as those violent headaches from indigestion or functional derangements of the stomach. The water removing the cause, removes the disagreeable nervous symptoms.

As regards the effects of the water on mucous membranes, besides that of the intestinal canal, we are not prepared to assert anything, although the distinguished German writer, on mineral waters, Dr. Vetter, states that the saline waters at Baden-Baden, when taken internally, exert a beneficial effect on chronic catarrh, leuchoræ, etc.

Action on the Kidneys.

This water acts on the kidneys; in part, on account of its constituents, and in part, from the water alone.

Action on the Glandular System, Scrofula, &c.

Glandular System, Scrofula, &c.

It is beyond all dispute that waters containing salt have a healthy action upon the glandular system, and when there is iodine present, however small the quantity

may be, continued use of the water is sure to be felt by that system. This substance, iodine, was discovered in 1811, and very shortly afterwards its medical virtues were ascertained, and it now ranks among the most important medical remedies. Within the last few weeks additional attention has been called to the subject by Dr. Boinet, in a communication made to the Academy of Medicine, in Paris. The doctor proposes the introduction of iodine into the daily food of persons laboring under any of the forms of this disease, such as worms, cretinism, enlarged glands, etc. Wherever iodine, he states, is abundantly diffused throughout the air,* these disorders are rarely seen, and that the energy of the vital functions is in the direct ratio of the quantity of iodine existing in the animal economy. He proposes to iodize bread, cakes, sirups, etc., etc., simply by the introduction of such plants as naturally contain iodine, viz: all kinds of sea-weeds and cruciferous plants, or else by using the water of iodized springs, or salts containing the same principle. Under these forms the quantity of iodine administered is so small as to communicate no peculiar taste to the edible substance. After ten years' experience, during which Dr. Boinet has treated children specially selected by a physician of a "*Bureau de Bienfaisance*" for their scrofulous habit, he has come to the conclusion that the diet he proposes, if persevered in for some months, will not only cure scrofula but ulcerous habits, diseases of the skin, opthalmia, caries of the bones, etc. The Academy of Medicine has referred Dr. Boinet's paper to a commission composed of Drs. Chatin and Trousseau. If there be any correctness in Dr. Boinet's statement, all mineral waters containing iodine will be invested with new interest.

Sufficient has been said to give a correct idea of the

*Reference is made to M. Chatin's recent experiments, showing the existence of iodine in the air.

medicinal properties of the water of Du Pont's Artesian Well, and to direct those interested in the subject as to what may be expected from its internal use.

External Uses.

External use.

The external use of this water will be doubtless found of great benefit, and if the proprietors should determine to apply fully its medicinal properties, they will have to construct proper baths. In most instances, and for the greater portion of the year, the water can be used at the temperature it has on flowing from the well; but for many purposes they will have to elevate the temperature 20 or 30 degrees. Thus applied, sulphur saline waters are well known to be beneficial for a variety of diseases of the skin, scrofulous affections, and lymphatic tumors of every description, gout, rheumatism, etc. In several of the diseases it would be proper to use the baths warm, as will be advised by those physicians who may direct the patients.

In addition to the above, it may be applied beneficially in many diseases of those mucous membranes that are accessible by washing, or by injection, as in certain diseases of the mucous membranes of the eye, etc., etc.

In reporting on the medical virtues of this water, I have purposely avoided any reference to those cases which have been cured, or supposed to be cured by it; for I have not traced out any of them, as I did not conceive any record of the kind would be of much value in so short a history of the water, but I have preferred to give my opinion of its virtues from its composition, and from the known virtues of similar waters. The opinions are little else than the reflections of those of physicians in this country, Germany, France, and elsewhere, who have paid especial attention to the medical properties of mineral springs, and who are engaged in giving advice on the subject.

In conclusion, I would remark that an important feature in this Artesian Well is its admirable location. Situated in one of the healthiest cities in this or any other country, and that from year's end to year's end, where the spring, early summer, and autumn, have many attractions for those seeking health or a temporary sojourn, prior to more Northern or more Southern journeyings.

In addition to this, Louisville will in one year be connected by railroad with the South and Southwest, and inhabitants of those regions, who may sojourn in this city, will be seperated but a day or two from their plantations.

In this report, I believe that no more than justice has been done to the hardy enterprise of the Messrs. Du Pont, the wonderful features of the well, or the medicinal virtues of the water.

CHEMICAL ANALYSIS

OF

MINERALS, MINERAL WATERS,

COAL ORES, &C.

Are made by Prof. J. LAWRENCE SMITH, M.D., and full reports given on the same when required. The facilities offered by the apparatus and machinery at the Louisville Chemical Works, which are under his immediate superintendence, enables him to conduct such Analysis on a more extended scale than is usual in private Laboratories.

Any one requiring further information will please communicate with Prof. SMITH.